

## ALTERNATIVES FOR DISTAL URETER RESECTION IN LAPAROSCOPIC NEPHROURETERECTOMY

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### ABSTRACT

**Objective:** To describe the initial experience of the authors with laparoscopic nephroureterectomy, and the technical aspects of the distal ureter treatment.

**Materials and Methods:** We retrospectively analyzed 6 patients submitted to laparoscopic nephroureterectomy from February, 2000 to May, 2001. The technical options to access the distal ureter described in the literature are discussed.

**Results:** Three patients had TCC (transitional cell carcinoma), two had chronic renal failure, vesicoureteral reflux and recurrent urinary tract infection, and one had distal ureteral stone and renal exclusion. Mean age was 54 years, and mean surgical time was 4 hours and 30 minutes. In 4 patients the nephroureterectomy was performed through the retroperitoneal access, and in the other 2 patients through the transperitoneal access, being four on the left side and two on the right side. In 2 patients the resection of the distal ureter and bladder cuff was performed through a Gibson incision; in 2, we used a vascular stapler and, in 2, ureteral intussusception. Mean hospital stay was 4.5 days (3 - 7 days).

**Conclusion:** The laparoscopic nephroureterectomy is a feasible procedure. Studies in the literature show its superiority to the open surgery, because of its advantages as a minimally invasive surgery. There are many available techniques to remove the distal ureter. Our access of choice, except in cases of transitional cell carcinoma in middle and distal ureter, is the technique of ureteral intussusception.

**Key words:** kidney; ureter; nephrectomy; laparoscopy; surgery

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### INTRODUCTION

As from the last decade, laparoscopic surgery has become popular in urology. Many medical centers are reporting their experience and technological advances in this type of procedure, mainly on ablative renal surgeries (1).

Nephroureterectomy with removal of the kidney, ureter and vesical cuff as a "block" is still the standard procedure for the treatment of transitional cell carcinoma (TCC). This procedure demands 2 skin incisions (flank and inferior abdomen), both with considerable associate surgical morbidity (2).

The first laparoscopic nephroureterectomy to treat transitional cells carcinoma was described by Clayman et al. in 1991 (2,3). From then on, many series of nephroureterectomy have been described (1-6).

In series comparing conventional surgery to laparoscopic, it was observed that the latter is superior in relation to morbidity, use of analgesic, hospital stay and return to daily activities. Oncologic principles are respected in cases of TCC (1,4). In spite of the fact that there is still no long term follow-up study with TCC patients (2), some authors have elected laparoscopy their procedure of choice (1,4).

Our objective was to describe our experience with laparoscopic nephroureterectomy and to comment the technical aspects of the distal ureter treatment.

## MATERIALS AND METHODS

Six patients were retrospectively analyzed. They had been submitted to laparoscopic nephroureterectomies from February, 2000 to May, 2001. The following parameters could be evaluated through the medical register: age, gender, surgical indication, hospital stay, operative time, analgesic use, postoperative complications and clinical follow-up.

From the 6 patients studied, 4 were men and 2 women. Age varied from 38 to 72 years (mean = 54 years). Nephroureterectomy was performed retroperitoneally in 4 patients and transperitoneally in the others (Table-1).

The options of distal ureter and vesical cuff removal were analyzed in relation to the access options described in the literature, emphasizing the advantages and disadvantages of such procedures found by the authors.

The access option, retroperitoneal or transperitoneal, was chosen at the time of the surgery in accordance with the surgeon preference. The treat-

ment option of the distal ureter was done at random, with the exception of the patients with tumor, when the access choice was based on the tumor localization.

Patients with TCC suspicion were evaluated by excretory urography, retrograde pyelography, abdomen and pelvis tomography, and semi-rigid ureteroscopy.

Pain criteria was subjectively analyzed by the patient via a questionnaire answered on the day of the surgery and during clinical follow-up, and by the use of analgesics (number of doses).

In 4 patients, the nephroureterectomy was performed through retroperitoneoscopy, according to the description of Gill (7). Instead of using the commercial balloon, we used digital maneuvers, Gaur balloon to create working space, and 3 subcostal ports to dissect the kidney (3). In the patients submitted to transperitoneal nephroureterectomy, the procedure was performed with the same number of ports. The kidney dissection was performed after medial colon detachment. In all cases, the surgical piece was removed after being placed into a bag through a 6-cm abdominal incision created from the extension of a port incision (Figure).

As for the distal ureter treatment, the vascular stapler was used in 2 patients after dissecting the

**Table 1** - Patient general data.

No.	Age	Gender	Diagnosis	Ureterectomy	Hospital Stay	Surgical Time	Complication
1	38	F	Renal failure / reflux	Stapler	7 days	5 h	Retroperitoneal hematoma
2	56	M	Renal failure / ureteral lithiasis	Stapler	4 days	4 h 15 min	0
3	63	M	TCC	Intussusception	3 days	5 h 30 min	0
4	42	M	Reflux (degree IV)	Intussusception	5 days	3 h 50 min	0
5	72	M	TCC	Gibson incision	4 days	7 h 30 min	0
6	54	F	TCC	Gibson incision	4 days	4 h	Incision hematoma

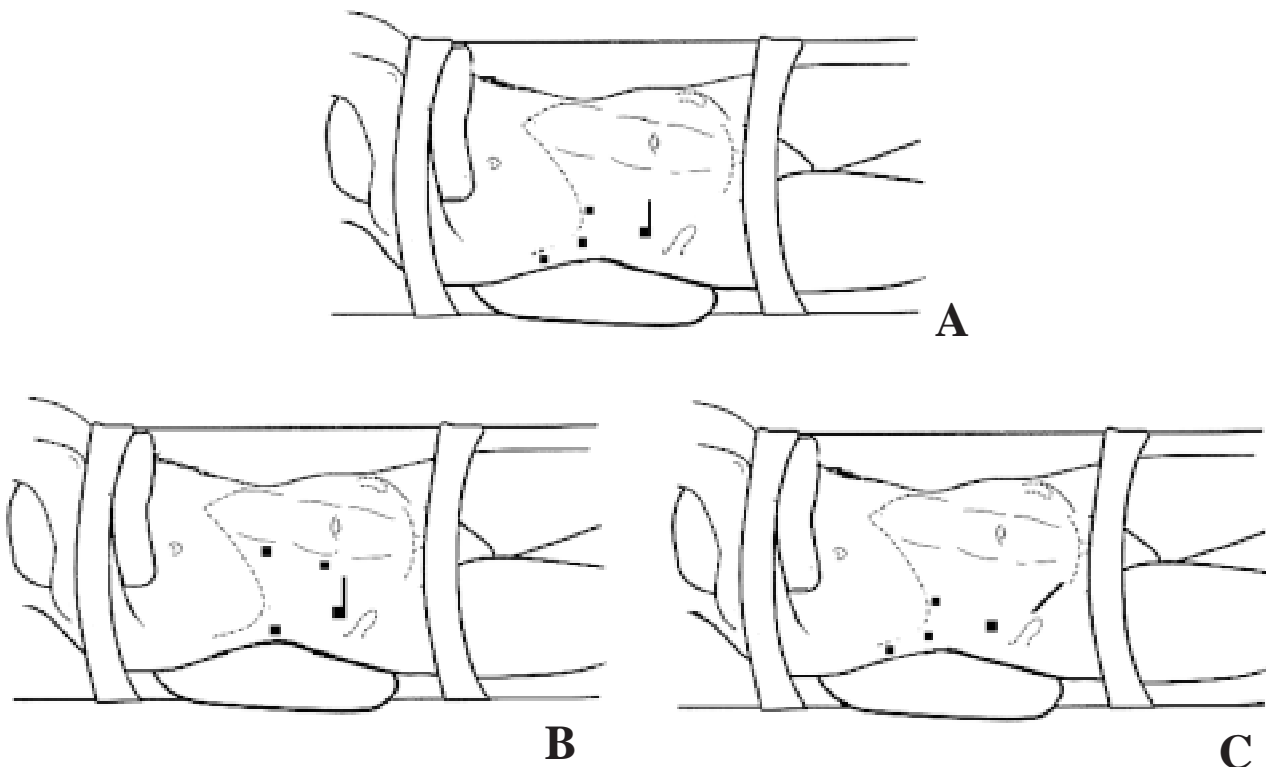
TCC = Transitional cell carcinoma.

ureter down to the bladder. The vascular stapler was inserted in one of the ports (12 mm) and the distal ureter was sectioned close to the bladder (Table-1).

In 2 patients, the distal ureter intussusception technique was used. In patients with TCC, the existence of tumor was evaluated in the preoperative before choosing this technique. This evaluation is performed through excretory urography and semi-rigid ureteroscopy, and, if necessary, with retrograde pyelography and abdomen and pelvis tomography. In case of suggestive tumor lesion, the surgical approach to remove the ureter was changed, depending on its localization. After dissecting the kidney and part of the ureter (down to the iliac vessels), a transverse incision is made approximately 6 cm above the anterosuperior iliac ridge, which extended from one of the ports' incision (Part A of Figure). The kidney

is then exposed. An opening is done in the medial ureter and a ureteral catheter is passed down to the bladder. This catheter is fixed to the ureter wall with a transfixing point in the catheter and ureteral wall. After passing the catheter, the ureter is sectioned and the kidney is removed. The abdominal wall is then sutured with the ureteral catheter in the retroperitoneum. The patient is placed in lithotomy position nad the catheter is pulled, everting the ureter. The vesical cuff is resected with resection loop or Collins loop. This technique is based on the open surgery principles proposed by McDonald in 1953 (8) (Table-1).

In the last 2 patients, we used the Gibson incision to remove the distal ureter and the vesical cuff. After laparoscopically dissecting the distal ureter down the iliac vessels and ligation of the renal ves-



**Figure** - Placement of the ports and location of the incision for kidney removal. A)- retroperitoneal access; B)- transperitoneal access; C)- Gibson incision.

sels, the Gibson incision was done. The surgical specimen is then removed from the vesical cuff and the bladder is sutured. Vesical catheter is kept for 5 days.

## RESULTS

Three patients presented TCC, one in the medial ureter and 2 in the renal pelvis. One patient had the tumor on the right side, while in the other 2, it was on the left side. Two patients presented vesicoureteral reflux, renal exclusion on the same side and recurrent urinary infection. One patient presented calculus on the left at the ureterovesical junction on the left, hydronephrosis, renal exclusion and lumbar pain which did not improve with analgesics (Table-1).

Mean operative time was 4 hours and 30 minutes, varying from 3 hours and 30 minutes in 1 patient with vesicoureteral reflux to 7 hours and 30 minutes in 1 patient with TCC. Distal ureter removal time was of 10 minutes in the patients submitted to ureteral intussusception, of 30 minutes in the patients submitted to Gibson incision, and of approximately 45 minutes in the patients submitted to laparoscopic distal ureter dissection. The time to change patients' position during surgery was not taken into account.

Hospital stay varied from 3 to 7 days, with a mean of 4.5 days. Postoperative analgesia was obtained through minor analgesic (acetaminophen) until the second postoperative day. There was no need of blood transfusion.

There were no major intraoperative complications or conversion need. One patient developed lumbar pain until the 5<sup>th</sup> postoperative day due to a retroperitoneum autolimited hematoma diagnosed by ultrasonography. One patient presented hematoma at the Gibson incision.

The pathological study of the TCC patients revealed stage II tumor in 2 patients and stage III in 1. All tumors were PT2N0M0 staging with margins free of neoplasia.

Patients with TCC diagnosis were clinically followed with excretory urography, abdomen and pelvis tomography, oncotic cytology, chest plain film and cystoscopy with biopsy. So far, none of them presented local or distant recidivation. Mean follow-up was of 6 months (4 - 12 months).

## DISCUSSION

Since 1991, when Clayman et al. described the laparoscopic access to nephroureterectomy (3), it has become an option of feasible access and has been performed in many centers (1-6), both retroperitoneally and transperitoneally. It has also been performed by the hand-assisted surgery (4) and by the surgery without gas (5).

Gill et al. observed that the laparoscopic surgery has more advantages than the open surgery. It presents shorter hospital stay, lower morbidity and sooner return to daily activities (1,3).

Operative time in our series was similar to the results reported in the literature. The long operative time (7 hours and 30 minutes) of one patient was justified by the TCC diagnosis inherent care. In this case, the operative time was also longer due to the use of the Gibson incision to remove the distal ureter. This fact did not influence the use of analgesics or the hospital stay.

The longest hospital stay was due to the patient's lumbar pain, which lasted until the 6<sup>th</sup> postoperative day. The pain was caused by an autolimited hematoma in the retroperitoneum.

The use of analgesics (acetaminophen) and return to daily activities was as expected for patients submitted to major laparoscopic surgeries (1).

Many distal ureter treatment options have been described in the literature (Table-2). Clayman et al. described the nephroureterectomy using a stapler to remove the distal ureter and vesical cuff (3). We have used this technique in 2 patients, one with distal ureter calculus and another with reflux (Table-1). We had great difficulty to access the distal ureter and the vesical cuff and the ligature of the bladder superior pedicle was necessary. Clayman et al. had already reported this difficulty to handle the distal ureter with this technique (3).

There are other options to remove the distal ureter, such as the one described by the Western General Hospital (Pluck procedure). In this technique, the ureteral meatus is endoscopically resected until the perivesical fat previous to the nephroureterectomy. This technique is fast, easy, and allows the simple cranial traction of the ureter to set it free from the

**Table 2** - Possibility of access for resection of the distal ureter after nephroureterectomy and potential disadvantage.

Access	Reference	Resection of Distal Ureter	Disadvantage
Extravesical	Shalhav et al. (3)	Stapler	Difficult access
	Gill (1)	Mini laparoscopic ports	Expensive material 2 additional ports
Intravesical	Dell'Adami et al. (10)	Abdominal incision	Additional incision
	Pluck procedure (9)	Endoscopic resection	Urine in the working space
	Stifelman et al. (5)	Laparoscopic transvesical access	Additional port
	Intussusception	Endoscopic intussusception	Not recommended for ureteral tumors

bladder. The main disadvantage of this technique is the possibility of neoplastic cells dissemination in the surgical site (9).

Gill et al. have used transvesical technique to dissect the ureteral meatus through 2 mini-laparoscopic accesses in the bladder and one endoloop to avoid retroperitoneum contamination with urine (1,2). This technique is limited to some medical centers where they have mini-laparoscopy material. Stifelman et al. use this same principle of transvesical access; however, with one 5-mm laparoscopic port to insert the endoloop and the resectoscope to resect the ureter (5). The technique described by Stifelman et al. (5), despite using the same principles described by Gill et al. (1), has the advantage of using the regular material used by the laparoscopic urologist.

We have used the Gibson incision to access the distal ureter in 2 patients with TCC (3). The advantage of this technique was the easy removal of the distal ureter and vesical cuff. Besides, it was possible to avoid any possibility of neoplastic cells dissemination in the surgical site. Dell'Adami et al. (10) used a suprapubic transverse incision to transvesically access the ureteral meatus, as a measure to avoid the dissemination of neoplastic cells in the retroperitoneum. We believe that the techniques which use an incision to access the ureter are effective to avoid the dissemination of neoplastic cells. However, they have the disadvantage of needing an additional incision.

In the other 2 patients, one with a localized TCC in the renal pelvis and the other with stage IV

reflux (Table-1), we have used the distal ureter intussusception technique described previously. The advantages of this technique are: there is no need of an additional incision and the procedure is fast, once it avoids ureter dissection to the vesical cope, which is a place of difficult laparoscopic access. It is also a good option because it can be performed with daily use material. It respects the oncologic principles as it does not allow neoplastic cells exposition in the surgical site, even with the ureter section, once it does not allow urine leakage. The disadvantage of this technique is that it is not recommended in patients with medial and distal ureter TCC, due to the possibility of ureter section in the tumor site.

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## EDITORIAL COMMENT

The authors report their initial experience with 6 cases of laparoscopic nephroureterectomy in the treatment of benign pathologies and upper tract transitional cell carcinoma (TCC). In 4 patients, the retroperitoneoscopy was used, being transperitoneal in 2 cases. Total operative time, hospital stay and complications were acceptable and similar to other series described in the literature. The short hospital stay and absence of major complications reflect the benefits offered by the minimally invasive technique when compared to the open surgery, despite the apparent longer operative time.

Different alternatives in the distal ureter and vesical cuff handling after laparoscopic nephrectomy were used by the authors, including the use of laparoscopic stapler, ureteral intussusception and open surgery (through Gibson incision) at the end of the procedure. Even though the number of cases and parameters checked in the study do not allow direct comparison to the techniques used in the distal ureter, the authors considered the ureteral intussusception their choice due to its facility. An appropriate revision about the several existent alternatives is presented by the authors.



The ideal ureter distal/cuff vesical approach during the radical laparoscopic nephroureterectomy is still under development (1). The preoccupation of reproducing with efficacy the oncologic principles of the open surgery prioritizes the alternatives with distal ureter occlusion – particularly the transvesical technique (Cleveland Clinic), open technique (Gibson or suprapubic incision) or the use of laparoscopic stapler (Washington University). Despite the good results in the literature, the latter presents a high risk of vesical calculus formation secondary to the titanium clamps in the long term, as there is still no absorbable laparoscopic staplers.

The actual laparoscopic nephroureterectomy results, both trans and retroperitoneal, even though requiring specific ability and training, characterize this minimally invasive procedure as the most beneficial and of greater impact in the urologic laparoscopy. The

data in this series of cases are in accordance with this impression. The substitution of 2 simultaneous incisions (lumbotomy and Gibson) or extensive single incision (xiphopubic median) by 1.5 – 2 cm incisions and small incision (6 – 7 cm) in the inferior abdomen to extract the specimen intact, mainly in TCC cases, is a huge technical advance. Once confirmed the oncologic adequacy of the method in a long term follow-up (> 5 years), it has the potential of becoming the treatment of choice.

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